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Time-Resolved Laser-Induced Incandescence Measurements of Particulate Emissions During Enrichment for Diesel Lean NOx Trap Regeneration

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ABSTRACT
Laser-induced incandescence is used to measure time-resolved diesel particulate emissions for two lean NOx trap regeneration strategies that utilize intake throttling and in-cylinder fuel enrichment. The results show that when the main injection event is increased in duration and delayed 13 crank-angle degrees, particulate emissions are very high. For a repetitive pattern of 3 seconds of rich regeneration followed by 27 seconds of NOx-trap loading, we find a monotonic increase in particulate emissions during the loading intervals that approaches twice the initial baseline particulate level after 1000 seconds. In contrast, particulate emissions during the regeneration intervals are constant throughout the test sequence.

For regeneration using an additional late injection event (post-injection), particulate emissions are about twice the baseline level for the first regeneration interval, but then decay with an exponential-like behavior over the repetitive test sequence, eventually reaching a level that is comparable to the baseline. In contrast, particulate emissions between regenerations decrease slowly throughout the test sequence, reaching a level 12 percent below the starting baseline value.